

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

SINGULAR COMPUTING LLC,

Plaintiff,

v.

GOOGLE LLC,

Defendant.

C.A. No. 1:19-cv-12551-FDS

Hon. F. Dennis Saylor IV

**DEFENDANT GOOGLE LLC'S MEMORANDUM OF LAW IN SUPPORT OF
MOTION FOR SUMMARY JUDGMENT THAT THE ASSERTED PATENT CLAIMS
ARE PATENT INELIGIBLE**

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I. INTRODUCTION

Singular’s patents fail the Supreme Court’s familiar two-step test for eligibility under section 101. *See Alice Corp. v. CLS Bank Int’l*, 573 U.S. 208, 216 (2014). At step one, the claims are directed to an abstract mathematical idea: a mathematical operation with low precision and high dynamic range. Because the claims specify only the *result*—not anything about how to *achieve* that result via a specific technological improvement—the claims are directed to patent ineligible subject matter.

At step two, Singular must show the claims contain an “inventive concept sufficient to transform the claimed abstract idea into a patent-eligible application.” *Id.* at 221 (cleaned up). Just three limitations in the asserted claims are even arguably distinct from the abstract idea to which the claims are directed. None transforms the claims into patentable subject matter, because each limitation is simply a direction to use the abstract idea in a conventional computer architecture.

First, the asserted claims recite an “execution unit” that is adapted to execute the imprecise mathematical operation. But the claimed “execution unit”—which comprises an arithmetic circuit paired with a memory circuit—was well-understood as a conventional computer component as of the priority date of the asserted patents, as Singular’s own expert concedes. Second, the asserted claims require the number of execution units in the claimed device that perform imprecise math to exceed by at least 100 the number of execution units that perform precise math. Again, this approach of mixing execution units of different precisions was well-known in the prior art, and in all events that limitation does not transform the claims into a concrete technological application of the abstract idea. Third, one asserted claim recites a “computing device” adapted to control the operation of LPHDR execution units. This “computing device,” too, is a generic computer component. Singular’s technical expert’s opinions to the contrary are purely conclusory and do not create any genuine dispute of material fact at step two.

Because Singular cannot patent math, and because the claim limitations do not identify any concept sufficiently inventive to transform the abstract mathematical ideas underlying the patent into a patent-eligible application, the Court should deem the asserted claims patent ineligible and grant summary judgment to Google.

II. STATEMENT OF MATERIAL FACTS PURSUANT TO L.R. 56.1

A. The asserted claims of the '273 and '156 patents

Singular asserts claim 53 of U.S. Patent No. 8,407,273 and claim 7 of U.S. Patent No. 9,218,156. Declaration of Michael S. Kwun ¶ 3. Each claims a “device” that comprises at least one LPHDR execution unit. *Id.*, Ex. 1 ('273 patent) at 31:62-64¹; *id.*, Ex. 2 ('156 patent), at 29:54-56.² The LPHDR execution units of a device of the asserted claims must accept a dynamic range of the possible valid inputs that is “at least” as wide as from 1/1,000,000 through 1,000,000. '273 patent at 32:60-62; '156 patent at 30:21-23. The asserted claims also require that for “at least” 5% of the valid inputs, the LPHDR execution unit outputs a signal that represents a numerical value that differs from the result of an exact mathematical calculation by “at least” 0.05%. '273 patent at 33:3-12; '156 patent at 29:62-30:4. Nothing in the asserted claims limits *how* this result should be achieved.

The asserted claims also recite an “exceeds” limitation that requires that the number of LPHDR execution units in the device exceeds by at least 100 the number of execution units adapted to perform mathematical operations on floating point numbers that are at least 32-bits wide (“32-bit precision execution units”). '273 patent at 32:13-17; '156 patent at 30:12-16. Claim 7 of the

¹ Claim 53 of the '273 patent depends from claim 43, which itself depends from independent claim 36.

² Claim 7 of the '156 patent depends from claim 3, which itself depends from independent claim 1.

'156 patent also requires a computing device adapted to control the LPHDR execution units. '156 patent at 30:5-6.

The common specification for these patents states that embodiments of “the present invention” are “directed to computer processors or other devices which use low precision high dynamic range (LPHDR) processing elements to perform computations (such as arithmetic operations).” '273 patent at 5:65-6:2; *see also id.* at 2:11-18. The specification does not set forth any particular structural approach for implementing the allegedly novel LPHDR processing elements. Rather it broadly asserts that “technologies whether based on transistors or not that are capable of implementing LPHDR architectures of the kinds disclosed herein” can be used—including hypothetical approaches such as “chemistry based technologies such as for DNA computing” *Id.* at 26:17-31. It further states that the word “device” should be understood to mean anything that “performs the functions disclosed” in the patent. *Id.* at 29:5-15. This could include “hardware, software tangibly stored on a computer-readable medium, firmware, or any combination thereof.” *Id.* at 29:16-19.

Whatever technology is used, the claims do not disclose any limitation concerning how the numerical values are represented, and the specification emphasizes the absence of any such limitation, noting, for example, that one mechanism could be to use “a logarithmic representation of the values,” while another would be to use “analog representations and processing mechanisms.” *Id.* at 6:10-12, 6:23-28. The specification goes out of its way to assert that “analog and mixed signal embodiments” are “merely examples,” and not limitations. *Id.* at 16:14-16.

B. The parties' expert reports

Google's technical expert on invalidity issues, Dr. John L. Gustafson, opines that the limitations of the asserted claims do not embody any technological innovations. Kwun Decl., Ex. 3

(Gustafson Rpt.) ¶ 703. In so doing, he addresses the limitations individually, *id.* ¶¶ 704-19, and also in combination, *id.* ¶ 720.

Singular served only one expert report that addresses patent eligibility—Dr. Sunil P. Khatri’s rebuttal report. Kwun Decl. ¶ 7. In the section of his rebuttal report that addresses patentability, Dr. Khatri begins with a summary opinion that the asserted patents “use a precise low-precision circuit to solve a technological problem that was not otherwise resolved by the art.” *Id.*, Ex. 4 (Khatri Reb. Rpt.) ¶ 255.

Dr. Khatri then repeats various assertions from the patent specification. *Id.* ¶¶ 256-59; *see also id.*, Ex. 5 (Khatri Opening Rpt.) ¶¶ 62-68 (cited in Khatri Reb. Rpt. ¶ 256). Other than reciting the limitations of the asserted claims, Dr. Khatri cites nothing from the specification that discusses the specific limitations of the asserted claims. *See* Khatri Reb. Rpt. ¶¶ 256 & 259 (citing specification’s discussion of the state of the art), 257 (simply reciting claim limitations³), 258 (citing specification’s assertion that those of ordinary skill believed that the invention—without limitation to specific claims—was of little use). Dr. Khatri asserts that the use of LPHDR execution units is purportedly novel over the prior art, that they offer improved performance, and that reduction to practice required different hardware. *Id.* ¶¶ 257, 260-67. He does not further elaborate on or provide support for these assertions.

Dr. Khatri does not offer any opinions about facts that could underpin a legal conclusion that the claims as a whole are inventive. *See id.* ¶¶ 255-72.

³ Paragraph 257 illustrates the lack of elaboration or support that is typical of Dr. Khatri’s patentability opinions: “The Asserted Claims define LPHDR with very precise limitations. Claim 53 of the ’273 Patent sets forth particular minimum levels of precision and specifies a dynamic range ‘at least as wide as from 1/1,000,000 through 1,000,000.’ ’273 Patent at col. 32 ll. 1-12, 60-62 [footnote 18: Claim 7 of the ’156 Patent sets forth identical parameters for precision and dynamic range]. Prior computing architectures did not include any such processing elements.”

III. PROCEDURAL HISTORY

After Singular filed its amended complaint, Google moved to dismiss on the ground that the patent claims are directed to an abstract mathematical idea, and fail to recite anything significantly more than the abstract idea itself. The Court denied the motion. Dkt. 51. First, the Court noted that the parties disputed the meaning in the claims of “low precision,” and the proper construction might affect the section 101 analysis. *Id.* at 11-12. In view of the unresolved claim construction issues, the Court withheld judgment whether the claims were directed to an abstract idea—step one of the *Alice* analysis. *Id.* at 12. Second, the Court concluded that there were questions of fact that could affect step two of the *Alice* analysis. *Id.* at 13. More specifically, the Court concluded that Singular’s allegations in its amended complaint “suggest” that even if the claims were directed to an abstract mathematical idea, “the particular way” in which that idea was incorporated into a computer processing architecture might be “unconventional” in a manner sufficient to transform the claims into patentable inventions. *Id.* at 14.

IV. LEGAL STANDARDS

A party is entitled to summary judgment if “the movant shows that there is no genuine dispute as to any material fact and the movant is entitled to judgment as a matter of law.” Fed. R. Civ. P. 56(a). Patents that claim abstract ideas are ineligible, under an implicit exception to the statutory definition of patentable subject matter. *Alice*, 573 U.S. at 216; 35 U.S.C. § 101. Ineligibility challenges on this basis are analyzed using a two-step framework. First, the Court must determine a pure question of law: whether the claims at issue are directed to an abstract idea. If so, at step two the Court examines what else is in the claims beyond that abstract idea. *Alice*, 573 U.S. at 217. The question at this second step is whether the claims include an inventive concept that transforms them into “significantly more” than the abstract idea itself. *Id.* at 217-18. Patent

eligibility ultimately is a question of law but may depend on underlying factual determinations. *BSG Tech LLC v. BuySeasons, Inc.*, 899 F.3d 1281, 1290 (Fed. Cir. 2018).

At step two, “the relevant inquiry is not whether the claimed invention as a whole is unconventional or non-routine.” *Id.* Rather, to be patent eligible, a claim must include an inventive concept that is *significantly more* than the abstract idea to which the claim is directed. *Id.* The “claimed invention’s use of the ineligible concept to which it is directed cannot supply the inventive concept that renders the invention ‘significantly more’ than that ineligible concept.” *Id.* Thus, for example, in *Alice*, where the claims were directed to the “abstract idea of intermediated settlement,” the Court “did not consider whether it was well-understood, routine, and conventional to execute the claimed intermediated settlement method on a generic computer.” *Id.* If an ordered combination “simply restates” the abstract idea, “it is irrelevant” whether that combination “may have been non-routine or unconventional as a factual matter.” *Id.* at 1291. “As a matter of law, narrowing or reformulating an abstract idea does not add ‘significantly more’ to it.” *Id.* “A narrow claim directed to an abstract idea . . . is not necessarily patent-eligible . . .” *Intell. Ventures I LLC v. Symantec Corp.*, 838 F.3d 1307, 1321 (Fed. Cir. 2016).

V. ARGUMENT

A. *Alice* step one: the asserted claims are directed to an abstract idea.

“[S]tep one of the *Alice* framework does not require an evaluation of the prior art or facts outside of the intrinsic record regarding the state of the art at the time of the invention.” *CardioNet, LLC v. InfoBionic, Inc.*, 955 F.3d 1358, 1374 (Fed. Cir. 2020). The step one analysis only requires “examining the patent claims in view of the plain claim language, statements in the written description, and the prosecution history, if relevant.” *Id.*; *see also* *Intell. Ventures II LLC v. FedEx Corp.*, No. 2:16-CV-00980-JRG, 2019 WL 2297048, at *13 (E.D. Tex. Mar. 29, 2019) (“*Alice* Step One is a purely legal question.”); *Ex parte Massonnat*, No. 2018-005981, 2020 WL 914577,

at *11 (P.T.A.B. Feb. 21, 2020) (“The question of whether a claim is directed to an abstract idea under *Alice* step 1 is still a question of law.”).⁴ A claim is not necessarily “directed to” an abstract idea simply because the concept underlies the claim; the court must determine whether the character of the claims as a whole is *directed to* that concept. *Palomar Techs., Inc. v. MRSI Sys., LLC*, 462 F. Supp. 3d 13, 22 (D. Mass. 2020). The specification may be useful in that determination, but the analysis must always yield to the claim language. *Id.* at 22-23. No clear boundaries have been drawn around the category of ineligible abstract ideas. *Id.* at 23. Courts regularly rely on comparisons between the claims at issue and claims already found to be directed to abstract ideas in previous cases. *Id.*

The asserted claims begin by reciting a device comprising “at least one first low precision high-dynamic range (LPHDR) execution unit” that is adapted to perform an operation on a high dynamic range of input values at least as wide as from 1/1,000,000 to 1,000,000, producing an output with a relative imprecision compared to the exact mathematical result of at least 0.05% for at least 5% of the valid inputs. *E.g.*, ’273 patent at 31:63-32:12, 32:60-63. The asserted claims recite no art or technology for the implementation of the mathematical concept of calculating results that fall within a specified range of imprecision, for a wide dynamic range of inputs.⁵ The specification confirms that this is not accidental, stating that the word “device” should be understood to mean *anything* that “performs the functions disclosed” in the patent. ’273 patent at 29:12-15. This could include “hardware, software tangibly stored on a computer-readable medium, firmware, or any combination thereof.” *Id.* at 29:16-19. Such a device can use “technologies

⁴ This does not mean that a court cannot, at step one, rely on judicially noticeable facts. *CardioNet*, 955 F.3d at 1373.

⁵ Singular’s expert, likewise, does not disclose any factual opinion that the claims somehow are implicitly limited to any particular art or technology. *See* Khatri Reb. Rpt. ¶¶ 255-72.

whether based on transistors or not that are capable of implementing LPHDR architectures of the kinds disclosed herein”—including hypothetical approaches such as “chemistry based technologies such as for DNA computing” *Id.* at 26:17-31. Whatever technology is used, the processing elements could use any means for representing numerical values, including “a logarithmic representation of the values,” or alternatively “analog representations and processing mechanisms.” *Id.* at 6:10-12, 6:23-28. And “analog and mixed signal embodiments” are “merely examples,” not limitations. *Id.* at 16:14-16. *See Digitech Image Techs., LLC v. Elecs. for Imaging, Inc.*, 758 F.3d 1344, 1350-51 (Fed. Cir. 2014) (“The method in the ’415 patent claims an abstract idea because it describes a process of organizing information through mathematical correlations and is not tied to a specific structure or machine.”).

The asserted claims thus are directed to the abstract idea of a type of imprecise mathematics: a mathematical operation with low precision (i.e., a certain amount of error) and high dynamic range (i.e., the ability to handle a large range of valid inputs). This is confirmed by the specification, which states that “the present invention” is “directed to computer processors or other devices which use low precision high dynamic range (LPHDR) processing elements to perform computations (such as arithmetic operations).” ’273 patent at 5:63-6:2; *see also id.* at 2:11-18. While at step one “reliance on the specification must always yield to the claim language,” *ChargePoint, Inc. v. SemaConnect, Inc.*, 920 F.3d 759, 766 (Fed. Cir. 2019), nothing in the claim language contradicts the specification’s assertion that “the present invention”—which necessarily includes the asserted claims—is directed to devices that use LPHDR processing elements to perform math.

The requirement that the degree of imprecision be *at least* 0.05% for *at least* 5% of the valid inputs does not render the idea of low precision, high dynamic range mathematics any less

abstract. Rather, those limitations simply set forth the parameters of the abstract idea by establishing the desired degree of imprecision. The Federal Circuit has held that a method reciting a combination of mathematical steps that results in *more* accurate results is not patentable. *In re Bd. of Trs. of Leland Stanford Junior Univ.*, 991 F.3d 1245, 1251 (Fed. Cir. 2021). Obtaining *less* precise results is no less an abstract idea. The broad, open-ended range for imprecision does not change that conclusion, either, because it is a functional result with no “limiting detail” that confines the asserted claims to “a particular solution to an identified problem” and is not “a concrete embodiment of that idea.” *Affinity Labs of Tex., LLC v. Amazon.com Inc.*, 838 F.3d 1266, 1269 (Fed. Cir. 2016). The asserted claims do not disclose a particular solution to the “problem” of using math that is too precise and therefore too computationally expensive. Instead, they merely direct that the claimed device should *be* less precise. The “purely functional” range in the limitation thus is an abstraction, not a concrete improvement. *See id.* (“The purely functional nature of the claim confirms that it is directed to an abstract idea, not to a concrete embodiment of that idea.”); *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1356 (Fed. Cir. 2016) (“[T]he essentially result-focused, functional character of claim language has been a frequent feature of claims held ineligible under § 101 . . .”).

For the same reasons, requiring that the processing element accept inputs over a dynamic range *at least* as wide as from 1/1,000,000 to 1,000,000 likewise does not suggest that the claims are not directed to an abstract idea. The dynamic range merely establishes the bounds of the abstract idea—calculations using a particular range of inputs to achieve a particular range of results. And the dynamic range is again stated in functional terms—that the device should accept a wide range of inputs—rather than being directed to a *particular solution* for achieving that aim.

The claims are, under the Court’s construction, limited to devices with “an arithmetic circuit paired with a memory circuit,” Dkt. 354 at 30, but that does not alter the outcome of the step one analysis. Requiring generic components such as arithmetic circuitry and memory—and nothing in the claim language or the Court’s construction specifies any non-generic details—“cannot transform a patent-ineligible abstract idea into a patent-eligible invention.” *Alice*, 573 U.S. at 223; *see also In re Bd. of Trs.*, 991 F.3d at 1248, 1250-51 (limitations requiring a “data structure” and recomputing “mutation rates that are stored within the data structure” are “generic steps of implementing and processing calculations” that “do not change the character of claim 1 from an abstract idea into a practical application”). For the same reason, the limitation in claim 7 of the ’156 patent that recites a generic “computing device” that is adapted to control the LPHDR execution units does not make that claim patent eligible. *Alice*, 573 U.S. at 223.

Finally, the “exceeds” limitation does not render the claim *directed to* anything less abstract. That limitation captures wildly different technological approaches. It would encompass, for example, a device with 150 LPHDR execution units and ten 32-bit precision execution units, but also a device with 65,536 LPHDR execution units and no 32-bit precision execution units at all,⁶ or one with 101,000 LPHDR execution units and 100,000 32-bit precision execution units. In the first example, there would be fifteen times as many LPHDR execution units; in the second, *only* LPHDR execution units; in the third, barely more—one percent more—LPHDR execution units. These entirely different technological approaches represent a broad technological environment in which the abstract idea might be used—not a specific solution to a technical problem in computer architecture. For this reason, the asserted claims cannot be directed to any

⁶ The asserted claims do not require that the device have any 32-bit precision execution units at all—they require that the device has a “non-negative” number of 32-bit precision execution units (and zero is not a negative number), and at least 100 more LPHDR execution units.

specific improvement in computer architecture based on the “exceeds” limitation. *See Alice*, 573 U.S. at 223 (“limiting the use of an abstract idea to a particular technological environment” is not enough for patent eligibility (cleaned up)).

Prior section 101 cases confirm that “if a claim is directed essentially to a method of calculating, using a mathematical formula, even if the solution is for a specific purpose, the claimed method is nonstatutory” subject matter under section 101. *Parker v. Flook*, 437 U.S. 584, 595 (1978) (cleaned up). A claim that is directed to a particular number format for mathematical operations is also patent ineligible. In *Gottschalk v. Benson*, the Court held that a “method for converting binary-coded decimal (BCD) numerals into pure binary numerals,” which was “not limited to any particular art or technology, to any particular apparatus or machinery, or to any particular end use,” was not patentable, because “[a]n idea of itself is not patentable.” 409 U.S. 63, 64, 67, 71-72 (1972) (cleaned up). Here, because the asserted claims are directed to an “abstract intellectual concept[]” about how to calculate mathematical results—namely, with low precision, for inputs over a high dynamic range—they are, like the claims at issue in *Flook* and *Benson*, directed to ineligible subject matter. *See id.* at 67 (holding that abstract intellectual concepts are not patentable, “as they are the basic tools of scientific and technological work”).

The intrinsic record more than suffices to demonstrate that the asserted claims are, at step one, directed to an abstract idea. *See CardioNet*, 955 F.3d at 1374 (holding that “[n]either *Bilski*, *Alice*, nor this court’s precedent” requires “evaluation of the prior art or facts outside of the intrinsic record regarding the state of the art at the time of the invention”). And because step one is a pure question of law, it would not matter if Singular’s technical expert, Dr. Khatri, offered opinions about purported facts that called any of the foregoing into question. Regardless, he does

not.⁷ For example, he does not disclose an opinion that the asserted claims require only particular solutions for achieving low precision, or for being able to process a high dynamic range of inputs. He does not mention or take issue with the specification’s assertion that a claimed device need not be based on transistors, and that a claimed device even could be constructed using chemistry-based technologies such as DNA computing. He does not dispute that the “exceeds” limitation encompasses vastly different approaches, including devices with *no* 32-bit precision processing elements at all, but also devices where on a relative basis the number of LPHDR processing elements is practically the same as the number of 32-bit precision processing elements.

In short, at step one, the asserted claims are directed to an abstract idea, not a concrete embodiment of that idea such as a technological improvement. And even if expert testimony were relevant at step one—and because step one is a pure question of law, it is not—Dr. Khatri’s opinions would not create a genuine dispute of material fact.

B. *Alice* step two: The asserted claims lack an inventive concept that is significantly more than the abstract idea.

Because the asserted claims are directed to an abstract idea, the question at step two is whether those claims contain an “inventive concept sufficient to transform the claimed abstract idea into a patent-eligible application.” *Alice*, 573 U.S. at 221 (cleaned up). In analyzing that question, the Court must consider whether “an element or combination of elements” in the asserted claims “is sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the ineligible concept itself.” *Id.* at 217-18 (cleaned up). Claims that merely apply “an abstract idea using well-understood, routine, and conventional activities previously known to the

⁷ According to Dr. Khatri, the asserted claims “are directed to computing devices that are constructed using circuitry that performs arithmetic using low-precision, high-dynamic-range representations.” Khatri Reb. Rpt. ¶ 265.

industry” fail at step two. *Cellspin Soft, Inc. v. Fitbit, Inc.*, 927 F.3d 1306, 1316 (Fed. Cir. 2019) (cleaned up). Likewise, “a claimed invention’s use of the ineligible concept to which it is directed cannot supply the inventive concept” necessary to save claims directed to an abstract idea. *BSG Tech*, 899 F.3d at 1290.

The asserted claims recite just three limitations that are even arguably distinct from “the ineligible concept to which [those claims are] directed.” *See id.* As explained above, the asserted claims are directed to a type of imprecise mathematics: a mathematical operation with low precision (i.e., a certain amount of error) and high dynamic range (i.e., the ability to handle a certain range of valid inputs). Much of the language in the asserted claims simply captures that abstract idea. *See, e.g.*, ’273 patent at 31:64-32:12 (reciting “a first operation” that captures this imprecise mathematics). The remaining claim limitations, discussed individually and collectively below, do not transform the claims into patentable subject matter.

1. The “execution unit” limitation does not transform the asserted claims into patentable subject matter.

The asserted claims recite an LPHDR⁸ “execution unit” that is “adapted to execute a first operation,” i.e., the imprecise mathematical calculation at the core of the asserted claims. *E.g.*, ’273 patent at 31:63-65. Nothing about this “execution unit” limitation supplies an “inventive concept sufficient to transform the claimed abstract idea into a patent-eligible application.” *Alice*, 573 U.S. at 221 (cleaned up).

The claimed “execution unit” was indisputably a well-understood, routine, and conventional computer component as of the priority date of the asserted patents. As construed by the Court, that “execution unit” is nothing more than a “processing element comprising an

⁸ Because the Court construed “low precision and high dynamic range” as defined in the claim itself, that phrase does not add anything above and beyond the abstract idea itself.

arithmetic circuit paired with a memory circuit.” Dkt. 354 at 25. Processing elements, arithmetic circuits, and memory circuits are all generic computer components that were well-known at the time of the alleged invention—and nothing in the claims suggests otherwise. *See Alice*, 573 U.S. at 223 (“[T]he mere recitation of a generic computer cannot transform a patent-ineligible abstract idea into a patent-eligible invention.”). Indeed, the specification describes existing array processors that distributed data over a grid of “processing elements” where each element “has its own memory.” ’273 patent at 3:49-50. And Dr. Khatri himself recognized that conventional computers have execution units. *E.g.*, Khatri Reb. Rpt. ¶¶ 264 (attempting to distinguish the claimed invention from “the execution units *of conventional computers*” (emphasis added)), 267 (same). Dr. Khatri has not, at any point, claimed that “execution units” themselves—defined broadly by the Court—are anything more than generic computer components. Nor could he, as the claims do not specify any way in which the “execution units” differ from conventional circuits.

Thus, based on the undisputed facts, the “execution unit” limitation cannot supply an inventive concept. *See Cellspin Soft*, 927 F.3d at 1316.

2. The “exceeds” limitation does not transform the asserted claims into patentable subject matter.

The asserted claims also require that “the number of LPHDR execution units in the [claimed] device exceeds by at least one hundred” the number of execution units that are adapted to perform 32-bit precision calculations. *E.g.*, ’273 patent at 32:37-41. Nothing about this “exceeds” limitation supplies an “inventive concept sufficient to transform the claimed abstract idea into a patent-eligible application.” *Alice*, 573 U.S. at 221 (cleaned up).

Google’s technical expert, Dr. Gustafson, opines that the “exceeds” limitation amounts to nothing more than a direction to use the abstract idea in a well-understood, routine, and conventional computer architecture. *See Gustafson Rpt.* ¶¶ 717-20. That limitation’s “approach of

mixing different precision execution units was well-known in the art.” *Id.* ¶ 717; *see also id.* ¶¶ 187-204 (describing hardware that can implement mixed-precision systems); ’273 patent at 5:31-33 (discussing prior graphics processors that “include[] support for 16 bit floating point . . . alongside support for 32 bit floating point, and increasingly, 64 bit floating point”). In his rebuttal report, Dr. Khatri discloses no contrary opinions, and thus fails to dispute that mixed-precision systems were well-known.⁹

Even aside from its conventionality, the “exceeds” limitation does not add “significantly more” to the abstract idea. *Alice*, 573 U.S. at 218. Because, as explained above in connection with step one, the “exceeds” limitation encompasses a vast range of different technological approaches, the limitation does not meaningfully cabin the abstract idea to a particular technical application. And Dr. Khatri’s opinions confirm that the “exceeds” limitation *as it appears in the claims* is not an inventive concept. These opinions generally focus on how, allegedly, the asserted claims require “deploying massive numbers” of LPHDR execution units and “far smaller numbers” of 32-bit precision processing elements. *See Khatri Reb. Rpt.* ¶¶ 258, 262-63. But the claims are not so limited. The “exceeds” limitation may be met even when there is only a one percent difference between the number of LPHDR execution units and the number of 32-bit precision execution units. *Gustafson Rpt.* ¶ 718. Thus, the substantial difference between numbers of LPHDR execution units and numbers of 32-bit precision execution units on which Dr. Khatri relies cannot provide the

⁹ Singular may point out that in the IPRs, the PTAB found that Google had not demonstrated that the “exceeds” claims were obvious. The PTAB’s finding was based on the limited printed and patent prior art grounds raised in the IPR, and in any event does not undermine the conclusion that mixed-precision systems were well known. As the Supreme Court has acknowledged, because obviousness under section 103 and patent eligibility under section 101 are not coextensive, a nonobvious claim can fail to disclose an inventive concept for purposes of section 101. *Flook*, 437 U.S. at 595 n.18. Here, the exceeds limitation, even if nonobvious, does not add significantly more to the abstract idea.

inventive concept for these claims. *Am. Axle & Mfg., Inc. v. Neapco Holdings LLC*, 967 F.3d 1285, 1293 (Fed. Cir. 2020) (“[W]e have repeatedly held that features that are not claimed are irrelevant as to step 1 or step 2 of the *Mayo/Alice* analysis.”). Moreover, the claims’ provision that there should be at least 100 more LPHDR execution units than high precision execution units does not suggest an inventive concept or technological improvement, as that number is arbitrary: nothing in the specification suggests anything special about having, specifically, 100 more LPHDR execution units. Based on the undisputed facts, therefore, the “exceeds” limitation cannot supply an inventive concept. *See Cellspin Soft*, 927 F.3d at 1316.

3. The “computing device” limitation does not transform claim 7 of the ’156 patent into patentable subject matter.

Claim 7’s only unique limitation, a “first computing device adapted to control the operation of the at least one first LPHDR execution unit,” does not transform that claim into patentable subject matter. The claimed “computing device” amounts to nothing more than a generic computer component. *See* ’156 patent at 30:8-12 (limiting the scope of “computing device,” at least in claim 7, to containing at least one of six different generic computer components); *cf.* Gustafson Rpt. ¶¶ 187-204 (discussing how many of these components were well known).

And to the extent that Dr. Khatri attempts to suggest that reducing the invention to practice required manufacturing “different” hardware, Khatri Reb. Rpt. ¶ 266, that is irrelevant to the inventive concept inquiry because no such hardware is disclosed within the claims themselves.

4. The ordered combination of elements does not transform the asserted claims into patentable subject matter.

Finally, the ordered combination of elements in the asserted claims does not supply an “inventive concept sufficient to transform the claimed abstract idea into a patent-eligible application.” *Alice*, 573 U.S. at 221 (cleaned up). Nothing in the ordered combination of limitations—which amounts to using the abstract idea in a particular technological environment—

transforms the claims into patentable subject matter. Gustafson Rpt. ¶ 720 (opining that the ordered combination of elements “claims a broad, open-ended scope of devices, rather than embodying a concrete technological innovation”); *Alice*, 573 U.S. at 223 (“limiting the use of an abstract idea to a particular technological environment” is not enough for patent eligibility (cleaned up)).

Dr. Khatri’s remaining opinions confirm that conclusion. Those opinions focus on the allegedly novel, beneficial aspects of the *abstract idea* of a low-precision, high-dynamic-range system. *See* Khatri Reb. Rpt. ¶¶ 256 (claiming conventional systems “were designed for great *precision*,” making the invention necessary (emphasis added)), 257 (discussing precise limitations in “precision” and “dynamic range”), 259-61 (similar), 264 (listing alleged benefits of abstract idea), 265 (arguing claims are “directed to computing devices that are constructed using circuitry that performs arithmetic using *low-precision, high-dynamic-range* representations” (emphasis added)). But those opinions are irrelevant to the step two analysis. *BSG Tech*, 899 F.3d at 1290 (holding the abstract idea cannot supply an inventive concept under step two).¹⁰

* * *

In sum, based on the undisputed facts, the asserted claims fail at step two. The elements in those claims, individually and as an ordered combination, do not recite an inventive concept sufficient to transform the claims into covering patentable subject matter. Accordingly, summary judgment is appropriate on step two.

¹⁰ Dr. Khatri’s rebuttal report also features a few conclusory opinions on the ultimate legal issue of patent eligibility. Khatri Reb. Rpt. ¶¶ 266-67. Because Dr. Khatri’s other opinions are irrelevant, these are unsupported conclusions of law that cannot be used to avoid summary judgment. *See RTR Techs., Inc. v. Helming*, 707 F.3d 84, 93 (1st Cir. 2013) (conclusory expert opinion did not preclude summary judgment).

VI. CONCLUSION

For the foregoing reasons, the Court should grant Google's motion and enter judgment that the asserted claims are invalid because they are directed to an abstract idea and lack an inventive concept that is significantly more than the abstract idea itself.

Respectfully submitted,

Dated: April 28, 2023

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